

## IT IS CLAIMED:

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1. ~~A biodetector for the detection of a selected substance comprising:~~
  - (a) ~~a signal converting element, comprising an extracellular ligand-specific moiety and an intracellular signal transforming domain, wherein said extracellular ligand-specific moiety selectively recognizes said selected substance, which recognition activates said intracellular signal transforming domain;~~
  - (b) ~~a transducer, wherein said transducer has an inactive and an active form which are distinct from each other, and wherein said activated intracellular signal transforming domain converts said inactive form of said transducer into said active form of said transducer; and~~
  - (c) ~~a responsive element, wherein said responsive element is activated by said active form of said transducer, resulting in a detectable signal.~~
- 15 2. The biodetector of Claim 1 wherein said responsive element comprises a transcription activation element which is activated by said active form of said transducer.
- 20 3. The biodetector of Claim 2 wherein said responsive element further comprises a nucleic acid encoding one or a plurality of gene product, which gene product or gene products produce said detectable signal, and wherein said nucleic acid is operatively linked to said transcription activation element.
- 25 4. The biodetector of Claim 3 wherein said detectable signal is light.
5. The biodetector of Claim 3 wherein said gene product is detectable by means selected from the group consisting of bioluminescence, colorimetric reactions or fluorescence.
- 30 6. The biodetector of Claim 3 wherein said nucleic acid comprises a luciferase operon.
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7. The biodetector of Claim 6 wherein said intracellular signal transforming element is a membrane signal transducer.

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8. The biodetector of Claim 7 wherein said membrane signal transducer is selected from the group consisting of bacterial two component regulatory systems, eukaryotic receptor-mediated signal transducers, prokaryotic receptor-mediated signal transducers.

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9. The biodetector of Claim 6 wherein said substance is selected from the group consisting of microorganism, virus, retrovirus, protein, sugar, ion.

10. A method for detection of a selected substance comprising:  
15 (a) generating a biodetector comprising:  
 (i) a signal converting element, comprising an extracellular ligand-specific moiety and an intracellular signal transforming domain, wherein said extracellular ligand-specific moiety selectively recognizes said selected substance, which 20 recognition activates said intracellular signal transforming domain;  
 (ii) a transducer, wherein said transducer has an inactive and an active form which are distinct, and wherein said inactive form is converted into said active form by said activated intracellular signal transforming domain; and  
 (iii) a responsive element, wherein said responsive element is activated 25 by said active form of said transducer, resulting in a detectable signal;  
 (b) adding said biodetector to a sample;  
 (c) measuring and quantifying said detectable signal; and  
 (d) correlating the levels of said detectable signal with the presence and quantity 30 of said substance.

11. The method of Claim 10 wherein said responsive element of said biodetector comprises a transcription activation element which is activated by said active 35 form of said transducer.

12. The method of Claim 10 wherein said responsive element further comprises a nucleic acid encoding one or a plurality of gene products which gene product or gene products produce said detectable signal, and wherein said nucleic acid is operatively linked to said transcription activation element.

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13. The method of Claim 12 wherein said detectable signal is light.

14. The method of Claim 12 wherein said gene product is detectable by means  
10 selected from the group consisting of bioluminescence, colorimetric reactions or fluorescence.

15. The method of Claim 12 wherein said nucleic acid comprises a luciferase  
15 operon.

Sub (12) > 16. ~~The biodetector of Claim 10 wherein said substance is selected from the group consisting of microorganism, virus, retrovirus, protein, sugar, ion.~~

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17. The method of Claim 13 wherein said detectable signal is detected by a light detection system.

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18. The method of Claim 17 wherein said light detection system is selected from the group consisting of luminometer, spectrophotometer, fluorimeter, CCD detector.

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19. The method of Claim 18 wherein the biodetector or the sample is fixed on a solid support.

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20. The method of Claim 19 which further includes fixing a series of biodetectors in an ordered array on a solid support such that a variety of substances comprised in a sample can be detected.

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